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EXAMINER	
YANG, RYAN R	
ART UNIT	PAPER NUMBER
2672	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/900,565	SPAULDING ET AL.	
	Examiner	Art Unit	
	Ryan R Yang	2672	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-18 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-18 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Claims 1-18 are pending in this application. Claims 1, 14 and 17 are independent claims. This action is non-final.

2. The present title of the invention is "Method for representing a digital color image using a set of palette colors".

Specification

3. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

Claim 1, item b, uses the term "supplementing", however, this term is not described in the specification.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. Claim 1 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of copending Application No. 09/900,564. Although the conflicting claims are not identical, they are not patentably distinct from each other because "supplementing the distribution of colors in the input digital color image by a distribution of important colors" can be satisfied by "boosting the distribution of colors in the input digital color image in response to the detected regions of important colors".

6. Claims 2-12 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 2-12, respectively, of copending Application No. 09/900,564.

7. Claim 14 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 17 of copending Application No. 09/900,564. Although the conflicting claims are not identical, they are not patentably distinct from each other because, in item a, "where the color of the additional pixels is distributed according to the distribution of important colors" and "the additional pixels are determined from detected regions of important colors in the input digital color image" are similar in scope since they both involves additional pixels.

8. Claim 15 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 18 of copending Application No. 09/900,564. Although the conflicting claims are not identical, they are

not patentably distinct from each other because "the additional pixels are provided in the form of a predetermined target image" is broader is scope than "the additional pixels are provided in the form of a target image containing color patches extracted from the detected regions of important colors in the input color digital image".

9. Claim 16 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 19 of copending Application No. 09/900,564.

10. Claim 17 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 20 of copending Application No. 09/900,564. Although the conflicting claims are not identical, they are not patentably distinct from each other because, in item a, "where the color of the additional pixels is distributed according to the distribution of important colors" and "the additional pixels are determined from detected regions of important colors in the input digital color image" are similar in scope since they both involves additional pixels.

11. Claim 18 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 21 of copending Application No. 09/900,564.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claims 1-2, 5, 9-10 and 13-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Balasubramanian et al.

14. As per claim 1, Balasubramanian et al., hereinafter Balasubramanian, discloses a method for converting an input digital color image having a set of possible input colors to an output digital color image having a set of palette colors, the number of palette colors being less than the number of possible input colors, wherein the set of palette colors is determined based on the distribution of colors in the input digital image supplemented by a distribution of important colors, comprising the steps of:

a) determining the distribution of colors in the input digital color image ("we assigned a local activity index α_k ... It was necessary to define a composite activity measure ... Colors were then categorized as belonging to one of three classes: a low, medium, or high activity class, by comparing their composite activity measures to two experimentally determined thresholds ...", page 286, column 2, line 20-49, distribution of colors is determined by categorizing);

b) supplementing the distribution of colors in the input digital color image by a distribution of important colors ("Colors were then categorized as belonging to one of three classes: a low, medium, or high activity class, by comparing their composite activity measures to two experimentally determined thresholds t_1 and t_2 ...", page 286,

column 2, line 46-49, by categorizing the colors, some colors are deemed more important than the others);

c) determining the set of palette colors to be used in the formation of the output digital color image responsive to the supplemented distribution of colors ("Three sizes of cubical cells were used in accordance with the three activity classes: small cubes of length l=2 that includes 2^3=8 possible colors ... In this example, the number of data points has been reduced from 52 to 13", page 286, last paragraph – page 287, first paragraph); and

d) forming the output digital color image by assigning each color in the input digital color image to one of the colors in the set of palette colors ("For a given test image, high values were initially chosen for t_1 and t_2 (i.e., most colors were finely prequantized), the image was quantized to 256 colors using the PNN algorithm", page 287, second paragraph).

15. As per claim 2, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra, and further discloses the distribution of important colors includes a distribution of skin-tone colors ("the quantization was kept fine in smooth areas such as the shoulder and cheeks", page 289, first paragraph, where it is inherent that shoulder and cheeks are regions of skin-tone color).

16. As per claim 5, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra, and further discloses determining the supplemented distribution of colors is accomplished by appending additional pixels to the input digital color image to form an enlarged input digital color image, where the

color of the additional pixels is distributed according to the distribution of important colors, and then determining the distribution of colors in the enlarged input digital color image ("when merging two clusters, their two color lists were simply appended. **When all merging was completed, each distinct color in the histogram was assigned an output palette color**, which was the centroid of the cluster where the input color belonged. Finally, an array of pointers was used to map each pixel location to the appropriate node in the histogram", page 286, third paragraph, line 7-13, where each cluster is a boosted distribution of colors in an image region).

17. As per claim 9, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra, and further discloses the set of palette colors is determined using a vector quantization algorithm ("The basic algorithm is an application of Equitz's clustering VQ technique ...", page 284, column 2, line 30).

18. As per claim 10, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra, and further discloses the output digital color image is formed by assigning each color in the input digital color image to the color in the set of palette colors having the smallest color difference relative to the color of the input digital color image ("the prequantization step should assign smaller quantization cells in RGB space to colors with low activity measures and larger cells to high activity colors ... Two colors would be assigned to the same cell if they belong to the same activity category corresponding to cell length *l*", page 286, column 2, last paragraph-page 287, column 1, line 6, the color falling within that color cell has minimum error according to that cell).

19. As per claim 13, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra, and further discloses the distribution of important colors is only used to supplement the distribution of colors in the input digital color image in color regions where the input digital color image contains a significant number of pixels (a typical image is 512x512 pixels, page 286, column 1, last line).

20. As per claim 14, Balasubramanian discloses a method for converting an input digital color image having a set of possible input colors to an output digital color image having a set of palette colors, the number of palette colors being less than the number of possible input colors, wherein the set of palette colors is determined based on the distribution of colors in the first digital image supplemented by a distribution of important colors, comprising the steps of:

a) appending additional pixels to the input digital color image to form an enlarged input digital color image, where the color of the additional pixels is distributed according to the distribution of important colors ("when merging two clusters, their two color lists were simply appended. When all merging was completed, each distinct color in the histogram was assigned an output palette color, which was the centroid of the cluster where the input color belonged. Finally, an array of pointers was used to map each pixel location to the appropriate node in the histogram", page 286, third paragraph, line 7-13, where each cluster is a boosted distribution of colors in an image region);

b) determining the distribution of colors in the enlarged input digital color image ("when merging two clusters, their two color lists were simply appended. When all merging was completed, each distinct color in the histogram was assigned an output

palette color", page 286, third paragraph, line 7-13, where each cluster is a boosted distribution of colors in an image region);

c) determining the set of palette colors to be used in the formation of the output digital color image responsive to the distribution of colors in the enlarged input digital color image ("when merging two clusters, their two color lists were simply appended. When all merging was completed, each distinct color in the histogram was assigned an output palette color", page 286, third paragraph, line 7-13, where each cluster is a boosted distribution of colors in an image region); and

d) forming the output digital color image by assigning each color in the input digital color image to one of the colors in the set of palette colors ("When all merging was completed, each distinct color in the histogram was assigned an output palette color", page 286, third paragraph, line 7-13).

21. As per claim 15, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 14, supra, and further discloses the additional pixels are provided in the form of a predetermined target image (where each of the merged cluster region is color from added pixel region).

Claim Rejections - 35 USC § 103

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

23. Claims 3, 4 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Balasubramanian et al. as applied to claim 1 above.

As per claim 3, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra.

As for the distribution of important colors includes a distribution of neutral colors, since Balasubramanian discloses "the quantization was kept fine in smooth areas", page 289, first paragraph, it would have been obvious to one of ordinary skill in the art to consider regions of neutral colors as regions of important colors in order to make the region look more natural.

24. As per claim 4, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra.

As for the distribution of important colors includes distribution of sky colors, since Balasubramanian discloses "the quantization was kept fine in smooth areas", page 289, first paragraph, it would have been obvious to one of ordinary skill in the art to consider regions of sky colors as regions of important colors in order to make the region look more natural.

25. As per claim 18, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra.

As for a computer storage medium having instructions stored therein for causing the computer to perform the method of claim 1, since Balasubramanian's is about digital image displayable on a computer monitor, it would have been obvious for

Balasubramanian to use a computer with storage medium to store instructions to perform such task on a computer.

26. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Balasubramanian et al. as applied to claim 1 above, and further in view of Balasubramanian et al. (5,432,893).

As per claim 6, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra.

Balasubramanian discloses a method of converting an input digital color image having a set of possible input colors to an output digital color image having a set of palette colors. It is noted that Balasubramanian does not explicitly disclose using a sequential scalar quantization algorithm to determine a set of palette colors, however, this is known in the art as taught by Balasubramanian et al. (5,432,893), hereinafter Balasubramanian (5,432,893). Balasubramanian discloses a method of determining a set of palette colors using sequential scalar quantization algorithm (column 6, line 5-18).

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Balasubramanian (5,432,893) into Balasubramanian because Balasubramanian discloses a method of converting an input digital color to an output digital color having a limited set of palette colors and Balasubramanian (5,432,893) discloses the quantizing process can be performed by sequential scalar quantization algorithm in order to achieve it in an optimum and highly efficient manner, column 6, line 15.

27. As per claim 7, Balasubramanian demonstrated all the elements as applied to the rejection of dependent claim 6, supra, and Balasubramanian (5,432,893) further disclose the sequential scalar quantization algorithm includes the steps of:

i) sequentially partitioning the colors of the supplemented distribution of colors into a set of color space regions ("sequentially partitioning said asymptotically optimal quantizer density chrominance and luminance axes through which said histogram is defined into a plurality of histogram cells", column 31, line 43-47); and

ii) determining the set of palette colors by selecting an output color for each color space region in the set of color space regions ("for each of said histogram cells, deriving a respective set of chrominance and luminance output codes", column 31, line 48-50).

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Balasubramanian (5,432,893) into Balasubramanian because Balasubramanian discloses a method of converting an input digital color to an output digital color having a limited set of palette colors and Balasubramanian (5,432,893) discloses the quantizing process can be performed by sequential scalar quantization algorithm in order to achieve it in an optimum and highly efficient manner, column 6, line 15.

28. As per claim 8, Balasubramanian demonstrated all the elements as applied to the rejection of dependent claim 7, supra, and Balasubramanian (5,432,893) further discloses determining the color value for each pixel of the output digital color image by identifying the palette color corresponding to the color space region containing the input color for the corresponding pixel of the input digital color image ("The output map

spatially associates each of the pixels of the image array with one of the numerical values of the respective YCC cells of the histogram ... so that an output image displayed thereby will faithfully replicate the color content of the original digital image", column 18, line 63- column 19, line 9).

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Balasubramanian (5,432,893) into Balasubramanian because Balasubramanian discloses a method of converting an input digital color to an output digital color having a limited set of palette colors and Balasubramanian (5,432,893) discloses the quantizing process can be performed by sequential scalar quantization algorithm in order to achieve it in an optimum and highly efficient manner, column 6, line 15.

29. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Balasubramanian et al. as applied to claim 1 above, and further in view of Gentile et al. (Journal of Optical Society of America, 1990)

30. As per claim 11, Balasubramanian demonstrated all the elements as applied to the rejection of independent claim 1, supra.

Balasubramanian discloses a method of converting an input digital color image having a set of possible input colors to an output digital color image having a set of palette colors. It is noted that Balasubramanian does not explicitly disclose step d) includes the use of a multi-level halftoning technique to assign each color in the input digital color image to one of the colors in the set of palette colors in such a way so as to approximately preserve the local mean color value, however, this is known in the art as

taught by Gentile et al., hereinafter Gentile. Gentile discloses a method of quantizing color images using multi-level halftoning technique (see title).

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Gentile into Balasubramanian because Balasubramanian discloses a method of converting input digital color image into output digital image with limited colors and Gentile discloses a method of quantizing the colors in order to achieve near-original image quality.

31. As per claim 12, Balasubramanian and Gentile demonstrated all the elements as applied to the rejection of dependent claim 11, supra, and Gentile discloses the multi-level halftoning technique is an error diffusion technique that distributes the quantization errors introduced when processing an input pixel to nearby input pixels that have not yet been processed (page 1019, column 2, line 10-11).

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Gentile into Balasubramanian because Balasubramanian discloses a method of converting input digital color image into output digital image with limited colors and Gentile discloses a method of quantizing the colors in order to achieve near-original image quality.

Conclusion

32. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Inquiries

33. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Ryan Yang** whose telephone number is **(703) 308-6133**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Michael Razavi**, can be reached at **(703) 305-4713**.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Ryan Yang
June 29, 2003